Advanced Aquaculture Technology
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Lecture 19
Introduction to Crab Culture

Hello everyone, my name is Professor Gourav Dhar Bhowmick from IIT Kharagpur. So, in today's lecture in the module we will be discussing about the technology of Crustacea farming, so the lecture material for this today's class will be like on the on the basis of crab culture.

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So, this is an integrated part of this advanced aquaculture technology course that we are learning through this NPTEL curriculum. So, the concepts that I will be covering in this particular lecture material is the introduction to the crab farming, Scylla spp or the mud crab and the methods of culturing of mud crabs; only the first two will be discussing right now in this particular lecture module, in the next lecture I will be discussing more other methods of culturing mud crabs as well. So, mostly I will be focusing on grow out culture and the fattening procedure in this lecture and we will be discussing about the other methods in the coming lecture.

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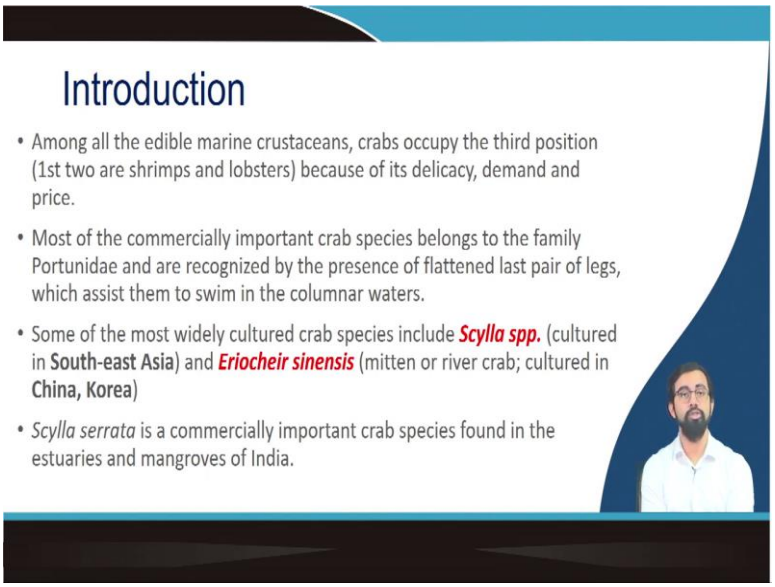

So, before starting about in details about the crab culture I think you already know that among all the edible marine crustaceans this crabs is very famous, it is almost in the third position just after shrimps and lobsters because of its delicacy, because of its specific taste and not only in India but also all over the world like especially if you go to Europe and Southeastern Asian region it is very famous all over there and it is a different species of crab actually. So, most of the commercially important crab species they belongs to the family Portunidae and are recognized by the presence of flattened last pair of lake and which assists them to swim along in the columnar water like not in the bottom or not in the surface but in the columnar water.

The most widely cultured spaces in the Southeastern Asia is like Scylla species as I told and also there is E-sinensis which is also called the river crab which is mainly cultured in China and Korea. So, the things that we will be discussing in my lecture series it will be mostly on the mud crab or the Scylla species only. The Scylla species especially the Scylla serrata it is a commercially important crab species found in most of the estuaries and the mangrove region in India.

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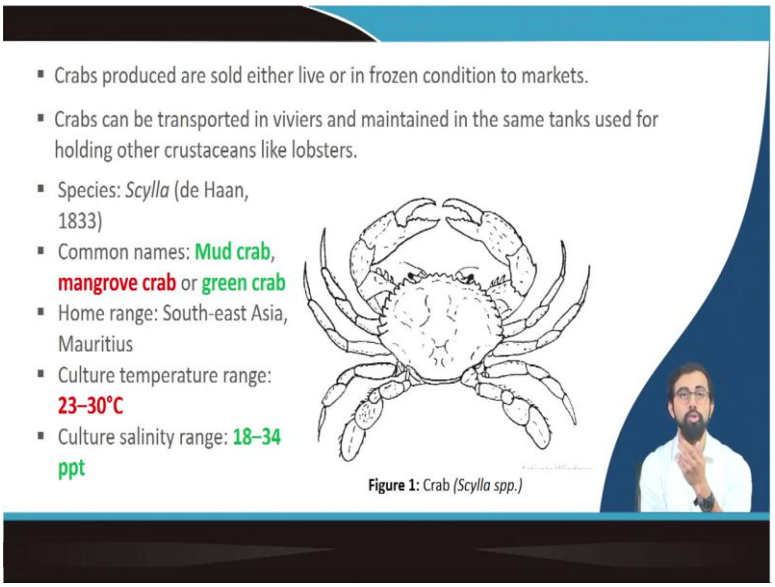

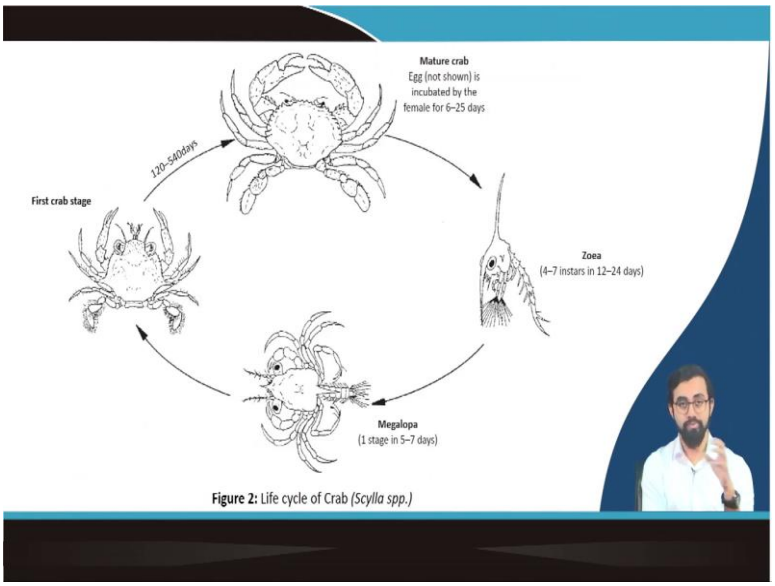

In general, the crabs are produced they are normally sold either live or in the frozen condition to the market and it is transported by in viviers or maintained in the same tank used for holding the other crustaceans like lobsters. The species that I will be mainly discussing on because of its importance, because of its availability and the market demand is the Scylla species as I already told it is also known as mangrove crab, green crab or the mud crab.

It is mainly dwelling region is the South Eastern Asia, Mauritius, etc. It normally requires the temperature range between 23 to 30-degree celsius and the salinity range between 18 to 34 ppt. If you see this life cycle of crab this Scylla species so mature crab when they lay the egg, so after say like it reaches the Zoea stage so it goes for 4 to 7 instars and which has a duration of total of 12 to 24 days and it metamorphes to the megalopa stage. In the megalopa stage it

stays for like around 5 to 7 days from there it turns into the first crab stage. In the first crab stage it stays like that for like around 4 to 8 months and even sometimes more depending upon the specific environment and all on the food availability and all these things and then it grows to the mature crab stage, so this is how their life cycle looks like.

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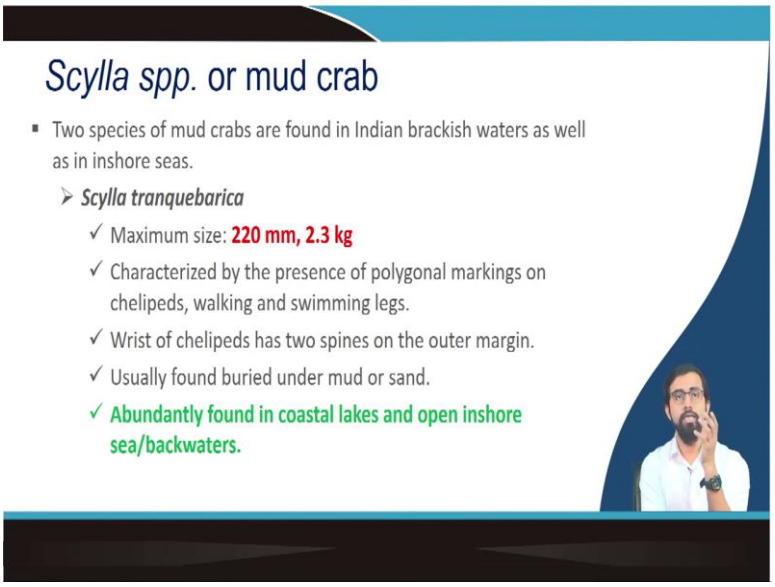

So, in general the mud crab, Scylla species can be of two types like it can be of a different other types as well especially in Indian brackish water region we find two types of mud crabs in general. One is Scylla tranquebarica which has a maximum size of up to 2.3 kg, so it is like really huge and it has a size of around 220 millimeter of nominal size and it can be characterized by the polygonal marking, different polygonal marking on your chelipads, walking and the swimming legs.

So the wrist of this chelipeds has two spines on its outer margin that is also a distinguishable feature for this kind of this Scylla species, Scylla tranquebarica, we normally find them like in the buried under the mud or the soil. You can abundantly find them in the coastal lakes open inshore sea, backwaters, etc.

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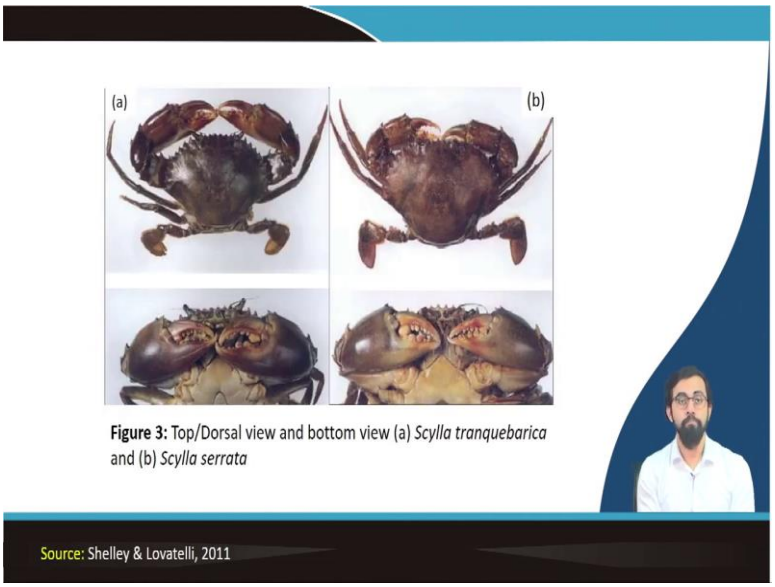

The other one is Scylla serrata I will discuss about it in the next slide only, so here if you see this clearly distinguishable features between these two type of crabs, first one the A is like top and bottom is like top view of the Scylla tranquebarica and the bottom one is the dorsal view of the bottom view of the Scylla tranquebarica, the same in the right side the it is a Scylla serrata. If you see the left side in the this scylla tranquebarica they have this specific polygonal structure in its swimming legs and also it is separate, where in case of skylla serrata they do not have this kind of structure in their body.

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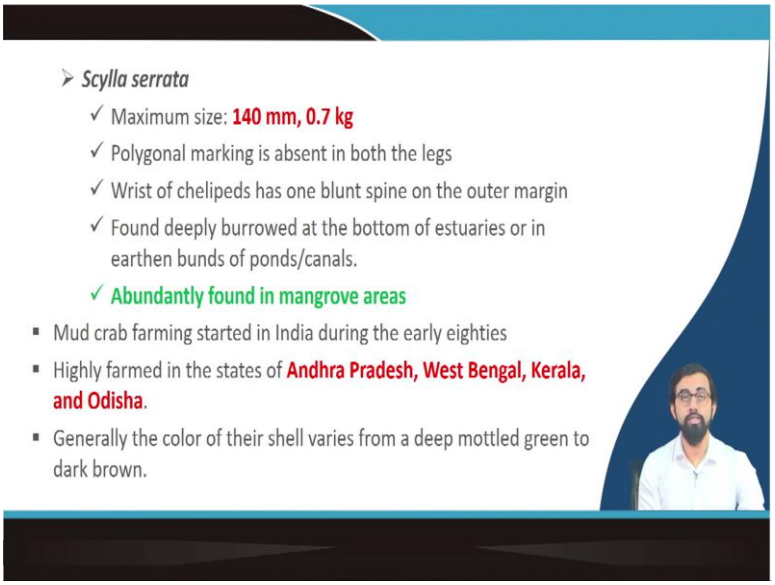

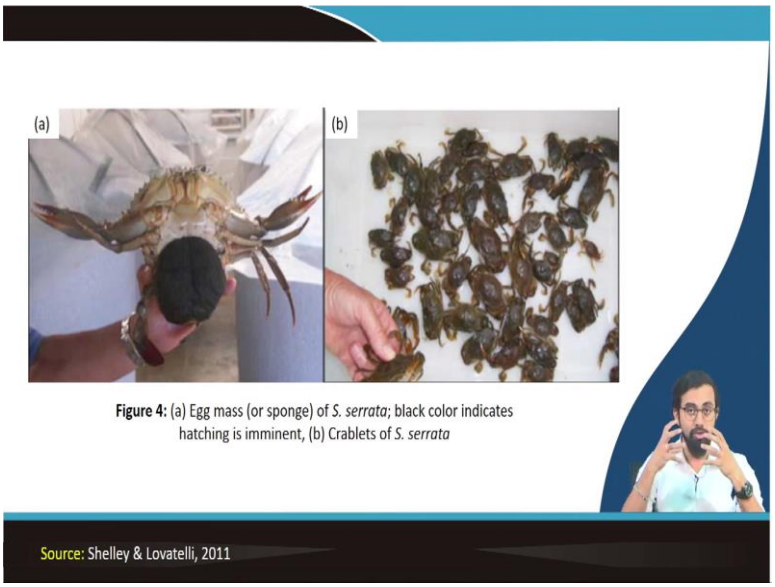

So, these polygonal markings are missing in this kind of structure and also what are the major distinguishable characters is like maximum sizes can be only 0.7 kg it does not go as high as the tranquebarica. It has a nominal size of around 140 millimeter and the wrist of this chelipads has one blunt spine on the outer margin.

So, it can be found very deeply borrowed on the bottom of the estuaries or in earthen bunds of the ponds and canals. It can be abundantly found in the mangrove areas, so in general the mud crab farming it started in India during the early eighties and it normally cultured in Andhra Pradesh, West Bengal, Kerala and Odisha, only in the eastern belt the major portion of it is cultured in the eastern belt, eastern coastal area and even in Kerala as well.

Generally, the color of their shell it varies from the deep molted green to the dark brown and even depending upon that also you can see how like delicious the spaces can be depending upon the color of their shell and all these things. In general if you see the egg mass or we call it sponge how it looks like how they carry it with this and see the black color of this sponge or the egg mask what we call it is indicating that the hatching is imminent that means it is going to hatch very soon and you see the crablets how it looks like this Scylla serrata crablets this is very small and they are just after the hatching is done.

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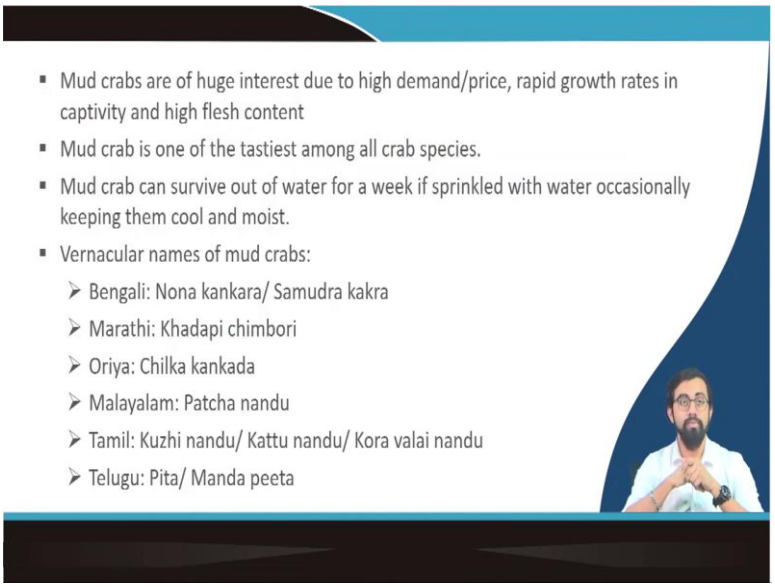

So, mud crabs they are of huge interest due to its high demand and price and the rapid growth rate in captivity and high flesh content and also its particular taste and also because of this reason this is a very prominent crab species that can be cultured in Indian context and I would really prefer like you or whoever is watching this video right now go and find out more details about the mud crabs and all and also you can ask the experts and there are a lot of employability opportunity on this kind of mudcrab culture in Indian context especially if you are staying near to the coastal region say in this Sunderman belt or this Mohona and all these things.

If you go to the Odisha this or the major portion of the Odisha is actually very much effective for culturing this kind of mud crabs and all it gives you a lot of export value to India as well, but still it is not as utilized as it can be as the opportunity lies here but there are a lot of opportunity for this for the young entrepreneurs like you to go ahead and go for this kind of mud crab farming.

So, it can survive out of water for a week which is a good thing about it because if you just sprinkle with the water occasionally just to keep them cool and moist it can survive for up to a week so you do not have to worry about the transportation, most of the cases the vegetables and the fish that we talk about it is very much perishable and what happened during the transportation only majority of the product is getting lost, we somehow loses its actual taste actual order or like actual shape.

But in case of crab that is the good thing because it can go for almost one week without water and all it can go and it can survive it, so you can simply transport it from one place to another

even in India, even outside India as well if you have a proper transportation system ready, supply chain system ready for you. In general, there are some vernacular names for the smart graphs in Bengali we call it Nona Kankara or Samudra kakra, in Marathi it has different name, so these are the name in Telugu it is called Manda Peeta and all these things. So, there are in different places the same crab has different vernacular names.

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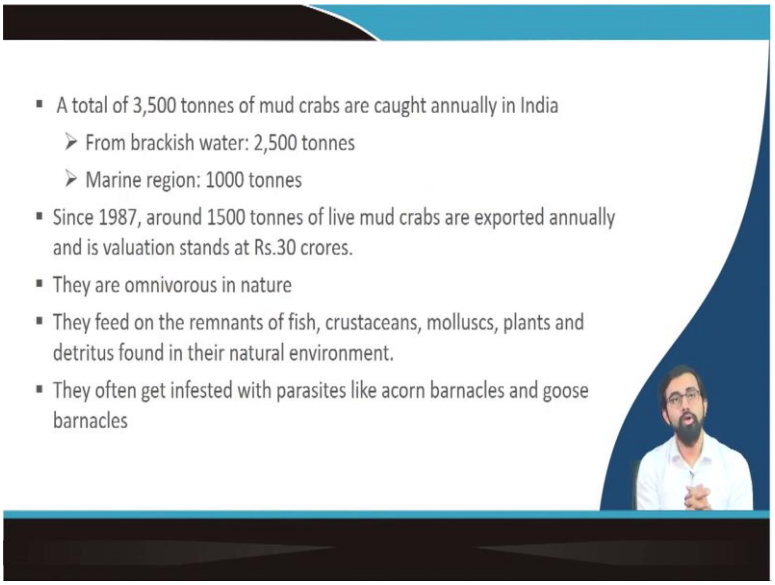

A total of 3,500 tons of mud crabs are caught annually in India according to the recent study and in brackish water more than 80 or 75 percent of it is done in the brackish water, whereas in marine region it is done like around proper marine regions around a thousand tones. In 1987 around 1500 tons of life mud crabs are exported annually and its valuation stands around 30 crores in 1987, very recent data is missing right now.

So, we are like working on it recently like maybe by the end of this year you will be able to get the information about the exact valuation right now what is standing about the mud crab cultivation and its valuation. They are in general omnivorous in nature, what is omnivorous, like they can have the vegetation, they can have the animals like they are not exactly herbivores or not carnivores they are both, they are with both but they normally try to have the feed they try to have as a food the remnants of fish, crustaceans, mollusks, plants or the detritus found in the natural environment.

So, if you supply it with the more amount of animal protein and all so they grow very fast in general we saw it in the research lab, they often get infested by but there is some problems associated with this kind of farming as well because they can be easily infested by the parasites like acorn barnacles and the goose bondicles but there are procedures to get rid of it as well to do the troubleshooting for this kind of or I would say like the disease controlling systems as well that is available.

So if you see the breeding of mud crab in India if you see the locality wise the period and the peak season the southern coast of India mainly the Kerala region, so there the peak season is September to February and you can grow it like for the year all over India it is possible to grow them throughout the year but the peak season is like some particular time when the number of production goes very high and which can be utilized for export purpose as well because it can definitely fulfill the internal demand and then it can go for the external market. The Karwar regions, in the Tuticorin region, Lake Pullicat, Kakinada region, so all these regions are there where normally we have this breeding of mud crab and the peak season varies place to place.

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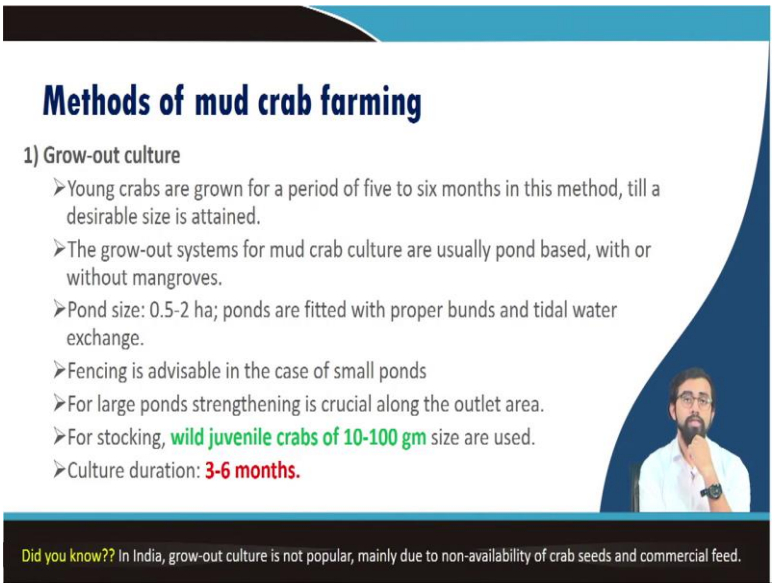

So, in general there are different methods for mud crab farming, so this lecture in today's lecture will only in this particular lecture material will only discussed about the two of them. Let us start with the grow out culture, in case of grow out culture the young crabs are grown in a period for like say 5 to 6 months in this method till are desirable sizes at it and the grow out systems the mud crab they are usually, culture is done in the pond normally with or without the mangrove with the size of around 0.2 to 5 hectares, you know what is hector right one hectare is 10 to the power 4 or like 10000 square meters.

So, it is like around two and a half acre, so the ponds are fitted with the proper bounds and the tidal water exchange, so then when the tidal level will high like when it will reach the high tide the sea water will come into your pond and it will provide you with the fresh sea water.

Then you have to have a discharge canal so when the low tide situation will happen so you can open the drainage canal and you can open this loose gate for the drainage canal so water will go back to the sea again. So, you have to design your titrate from accordingly based on the highest high tide level and the lowest low tide level, you can have the seawater exchange in your pond. Fencing is obviously advisable because they can they can crawl around so you can definitely lose them so better to have a proper fencing around in this growout culture systems.

Larger pond strengthening is very crucial along with the outlet area and for stocking wild juvenile crabs are actually used which is not good which is not actually detrimental one of the major reason because we are actually catching like somehow we are reducing the population

in the wild, I mean like wild population in the natural environment because there is a problem for the propagation method we have to collect the wild juvenile crabs of around like 10 to 100 gram size in general. Culture duration 3 to 6 months and in general they took around 3 to 6 months.

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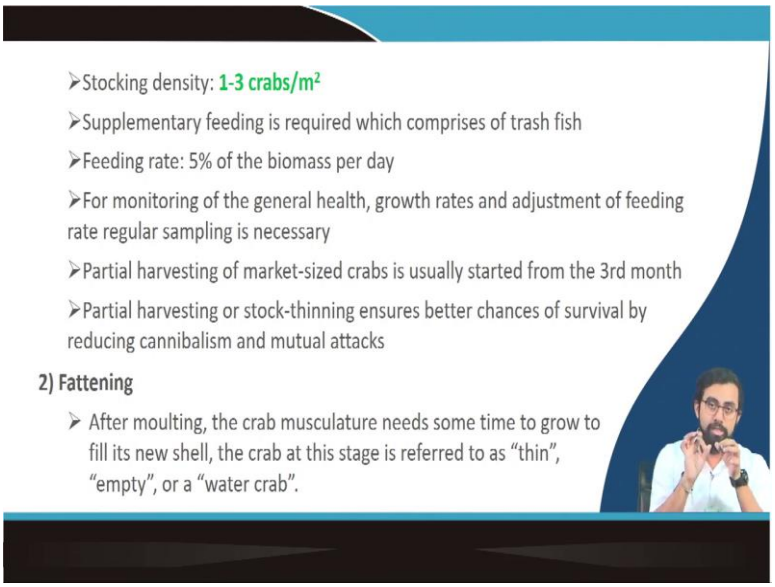

This is the mud crab grow out pond how it looks like and this is see the earthen mud crab pond culture with the netting, you can see the nets the simple net structure. It prevents the mud crab to crawl around and go out of the pond area, so in general the stocking density are one to three crabs per square meter we provide, supplementary feeding is required which comprises of mainly the trash fish, always remember you have to provide at least 5 to 10 percent of the biomass as a feed per day, what does that mean actually suppose you have a crab of around like say 100 kg in your pond so every day you have to provide at least 5 kg of feed to your biomass I mean like to your culture species that is kind of mandatory.

So, at least 5 to 10 percent of its biomass of the culture species has to be provided as a feed every day, the feed can differ it can be anything like right from the roti fire when it is very small, can be artemia a new place when it is like reaches a certain stage and then you can provide them with the trash fish, you can provide them with the like, there are a lot of opportunities, there are a lot of animal based proteins that you can supply it with depending upon the availability or not.

In general the the partial harvesting can be done when market size crab they reached around at the end of third month and you have to properly monitor for their general health growth rate and the adjustment of the feeding rate, regular sampling is very necessary because you will not be able to understand like what is its feed demand because after every 7 to 10 days you put them out randomly collect say like 10 or 20 pieces of them and weigh it and because as per the calculation you can find out the total average, you can easily get the average biomass and you multiplied with the total number of crabs that you are culturing there and just supply it and 5 percent of it is will be the feed.

So, based on that you will supply them with the feed. Partial harvesting or the stock thinning ensures that the better chances of survival by reducing the cannibalism and the mutual attack, so what does it mean what is cannibalism and the mutual attack? Sometimes what happens, when sometimes they reach a higher stage of their growth system, if by somehow you you provide them with the minimum amount of food and because of their natural habituation what they do they will go and attack the other crabs, so this is how it works.

This is called the cannibalism or the mutual attacks, so in order to reduce that we need to go for partial harvesting sometimes in this kind of culture systems. So, what is the second method that we can discuss today it is like the fattening. After moulting is done the crab musculature needs some time to grow its filled to its new shell, so the crab at this stage is called the thin empty or the watercrab. What does that mean? It means like when it reaches around we need 5 months for particular crab species to grow, so at the end of 4 months it almost reaches its harvesting market size, however still their meat concentration is not at its optimum level.

So, though their shell is formed it is thin and however the meat portion is not actually sufficient enough or not actually fully grown enough, by looking by even by your naked eye we can think that it is grow it is done so it is already in the market size let us just harvest them and we use them no, do not do this.

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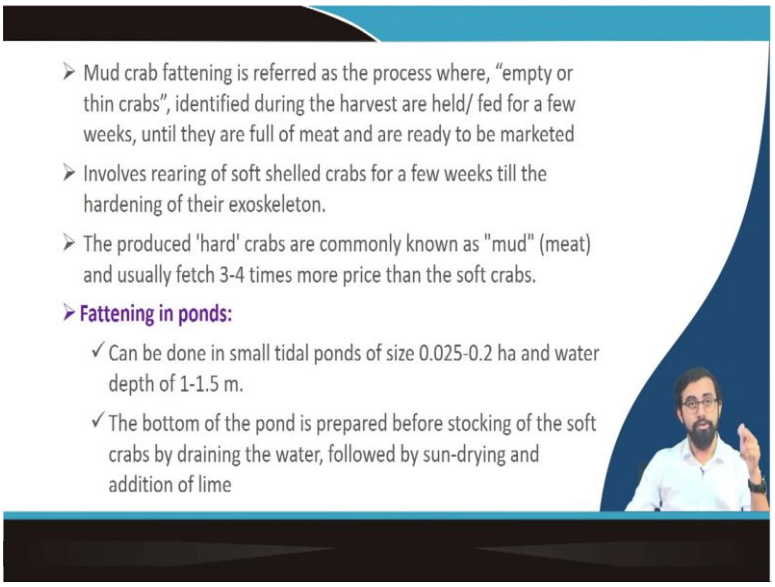

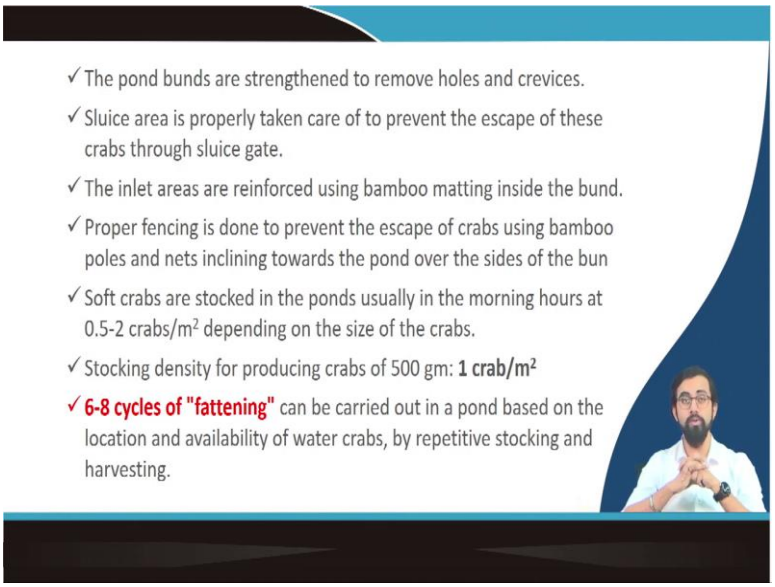

In this fattening method what we do so we like try go for this we call this process as an empty or the thin crabs. In general, we identify them and then we harvest them after a few weeks until they are full of meat and ready to be actually marketed. It involves with rearing of the soft-shell crab for a few weeks till the hardening of the exoskeleton and the produced hard crabs are commonly known as the actual mud.

So, it usually usually it pays around three to four times more price than the soft crabs just because their amount of meat that is available there. So, in case of a mud or like the final stage when it reaches its hard crab stage now it is become more costlier and just you need to wait for a couple of weeks and to keep it in that stage.

So, in general, how this fattening is done or fattening from the word itself you can understand like why it is called fattening. Fattening is normally done in a small tidal point of size of around point 0.025 to 0.2 hectare and a water depth of around 1 to 1.5 meter. The bottom of the pond is prepared before stocking of the soft crab by draining the water followed by sun drying and the addition of lime to get rid of all the unwanted micro organisms or say like predators or there is a less chance of a predator but still the unwanted, unhygienic microorganisms and all.

So, in order to do that we first get rid of all the water after we get rid of the water we sun dry the bottom of the pond and then we put the lime layer in it. Then we strengthen all the pond bunds to remove all the holes and the crevices so that it will cannot pass through it. The sluice area is properly taken care of to prevent the escape of these crabs through the sluice gate and the inlet area are reinforced using the bamboo matting inside the bund so in order to go for further enhanced structural stability and all.

Proper fencing is done to prevent the escape of crabs we can use the bamboo poles and net incline towards the pond over the sides of the bund so what will happen it will be like this suppose this is the pond so the fencing will be like this towards the bond side so and it will incline towards the pond side.

The soft crabs are stocked in the pond usually in the morning hours say like 0.5 to 2 crabs per square meter that will be the stocking density depending upon the size of the crab. Stocking density for producing crabs like say 500 gram is around one crab per square meter. As I mentioned like depending upon the size it can vary from 0.5 to 2 crabs per square meter, so in general 6 to 8 cycles of fattening can be carried out in a pond based on the location and availability of the water crabs and by repetitive stocking and harvesting.

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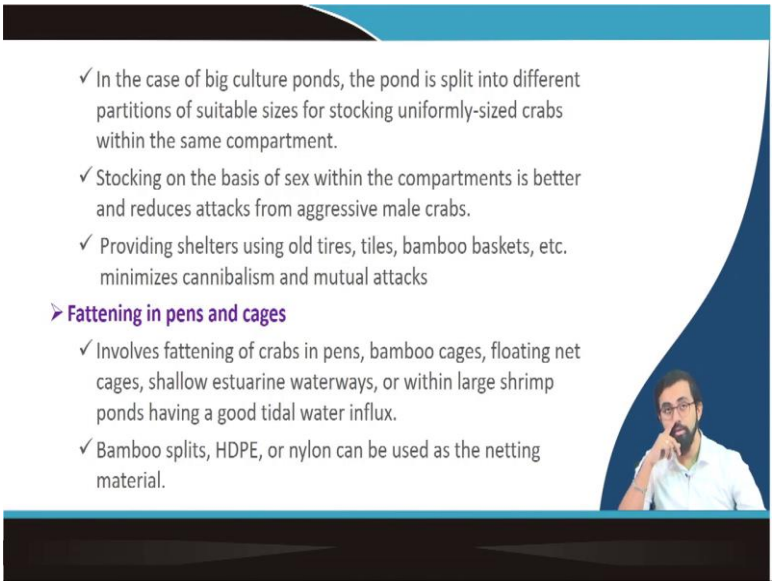

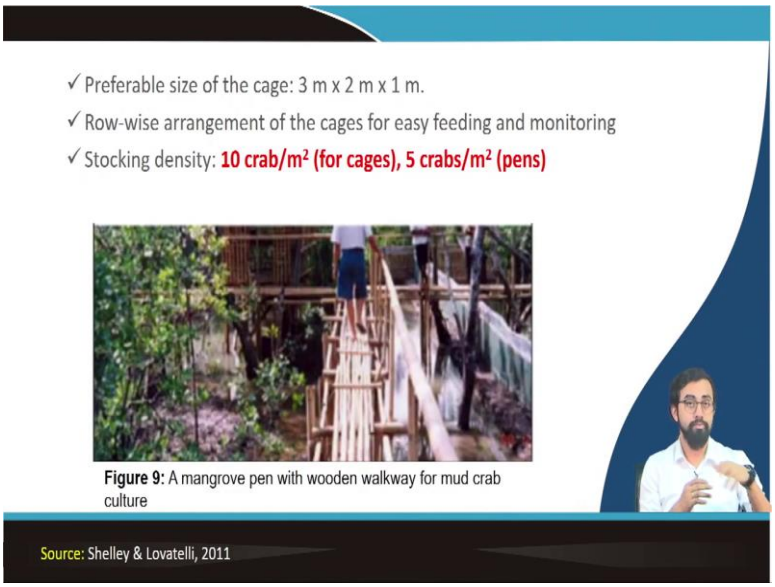

This is the individual container for mud crab fattening, so in general in case of big culture pond, the pond is split into different partitions of suitable size for stocking uniformly sized crabs within the same compartment. Then the stocking on the basis of sex within the compartments is better and reduces the attack of the aggressive male crab, so you you put a proper compartment for the male crabs, proper compartments for the female crabs, because because of that there will be no competition for a female crab between two male crabs and it will cause the cannibalism as I mentioned or the mutual attacks. We could provide the shelter using the old tires, tiles, bamboo baskets, etc to minimize the cannibalism or the mutual attacks.

In general the pen or in a cages also we can do this kind of flat fattening process, so if we talk about the marine culture because earlier we were discussing about the fattening in the pond that means which is in the coastal region you are kind of depending upon the tidal movement of the sea.

So, based on that your seawater exchange can be happen, but in case of pen and cage you do not have to worry about the freshwater sorry seawater exchange because it involves the fattening of the crabs in pens and bamboo cages or the floating net cages or shallow assuring waterways which we can call it as a pen or within the large stream ponds having the good tidal watering influx. Bamboo splits, high density polyethylene or nylon can be used as a netting material.

In this kind of cases preferable size of the cage if it is a cage culture should be around three by two by one meter of size, so around six cubic meter volume with a row size arrangement of the cage for easy feeding and the monitoring you have to provide and then stocking density

can be as high as 10 crabs per square meter and five crabs per square meter form even for the pen culture which definitely increases your productivity.

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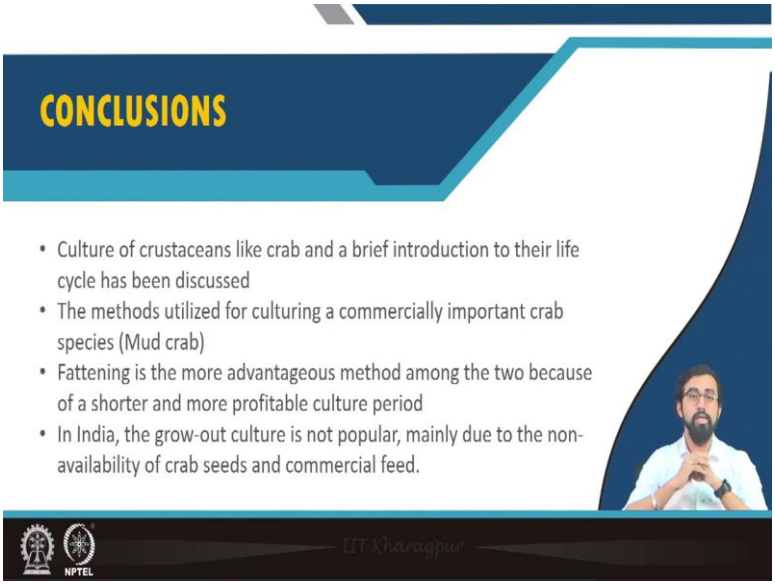

So from all these from these two culture methods that we discussed, what are the conclusions that we can come up with so we discuss about the culture of crustaceans like crab and the brief introduction of their life cycle, we discuss about the commercially important crab species that is mud crab, we discuss about the fattening and actually fattening is more advantageous method among the two that we have discussed because it is a shorter and more profitable culture period. In India the growout culture is not popular much mainly due to the non-availability of the crab seats and the commercial feed.

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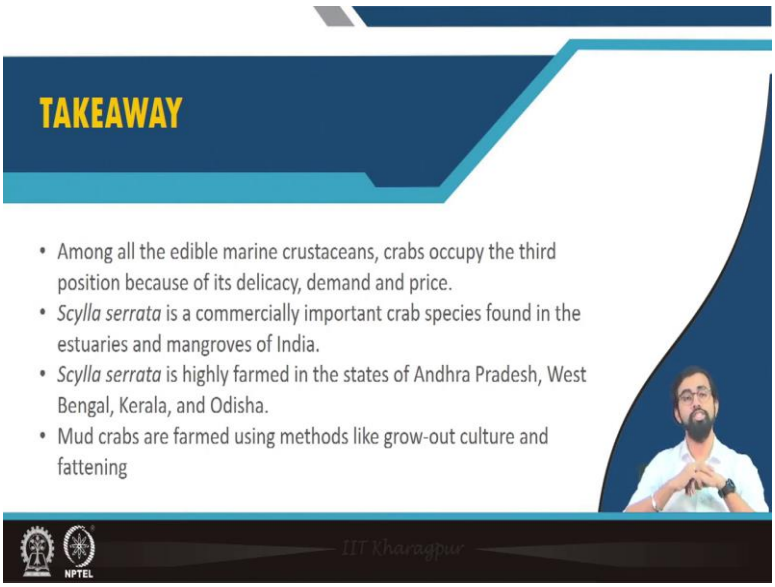

So, what are the takeaway messages that you can have from this from this lecture among all the edible marine crustaceans, crabs occupy the third position because of its delicacy, demand and price just after the shrimps and lobsters. Though sometimes it depends upon the people sometimes people like me I do like crabs more than the lobsters and also, so has a very huge demand.

The Scylla serata is mainly very famous crab species that is found in the Indian estuary and the coastal region mostly and it is highly found in the states of Andhra Pradesh, West Bengal, Kerala and Odisha. However there is a huge opportunity for it to grow further, so this kind of culture species there are cultural methods are already available, there are scientific discussions are going on like how to increase the production of this kind of crab species and I already discussed about you get a point like if you go for pen culture, if you go for cage culture you can increase the production very much and which will give you much higher economic revenue, because it will give you a less design constraint, less land acquisition.

Other than that, first of all India is having almost 7500 kilometer of long coastal region which is like around 2 million square kilometer of exclusive economic zone where any Indian citizen with a proper permission you can go and do the business in this region. So there is ample opportunity that is what I always talk about like this things are very basic stuff that we are discussing but there is a lot of opportunities lies in the market in the outside if you go outside and you just start doing business, start doing working on it think about it how to increase the profitability further and there are a lot of scientific research available, there are experts available in India itself. So, you just talk to them decide like how to grow your own business ideas, how to grow your own entrepreneurship mindset on this kind of activities, on this kind of culture things.

In general mud crabs are using we discuss about the methods like grow out culture and fattening in this lecture, however in the next lecture material I will be discussing more about what are the other methods that are available for culturing of crab species in India, but not only in India but outside in India as well specifically for this kind of mud crabs.

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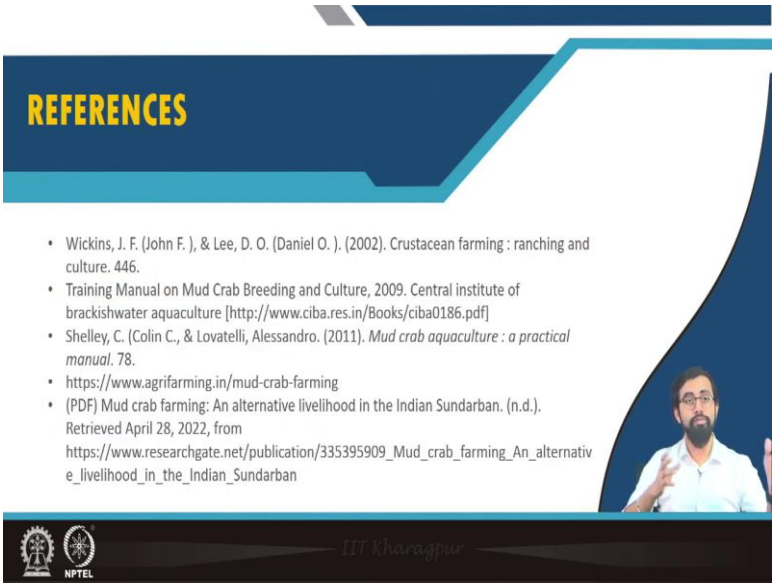

So, these are the references that you can take a picture or you can just go and google it and it will give you some additional information about all the stuff that I have discussed and it will give you a lot of knowledge about what exactly is happening in the mud crab forming in Indian context as well as an international context. So, that is it so thank you so much maybe you get to know some very valuable information regarding the mud crab, so we will discuss more details in the next lecture, thank you.